23rd IAA SYMPOSIUM ON SPACE DEBRIS (A6)
Interactive Presentations - 23rd IAA SYMPOSIUM ON SPACE DEBRIS (IP)

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INCENTIVIZING RESPONSIBLE SPACE PRACTICES THROUGH THE DEBRIS OFFSETTING FUND AND SPACE SUSTAINABILITY RATING

Abstract

The unprecedented growth in space activities has led to critical congestion in Low Earth Orbit (LOE), with space debris posing a significant risk to operational satellites, scientific missions, and future space exploration. While technical solutions for debris removal exist, their implementation has been hampered by limited funding initiatives and economic incentives. While the majority of space actors are aware of their responsibility, the current system creates financial disadvantages for actors with high debris avoidance efforts. This paper proposes the Debris Offsetting Fund (DOF), a financing mechanism that creates a level playing field for space actors to act responsibly in space. It is designed to hold satellite and launch providers accountable for potential debris generation and to incentivize responsible space practices.

The DOF leverages the existing Space Sustainability Rating (SSR) system developed by eSpace-EPFL to assess the potential debris contribution of satellite and launch providers. These providers would then contribute to the DOF based on their SSR, effectively offsetting their orbital impact. This approach not only encourages responsible behavior by penalizing potential debris generators, but also generates critical funding for active debris removal efforts. The DOF will initially be non-binding and will be implemented within five years to encourage early adoption and allow for gradual integration across the space industry.

Through quantitative analysis, we demonstrate how the DOF operates by collecting SSR-based contributions, supporting national space agency-led debris removal missions, and investing in active debris removal technologies. The implementation framework involves established leaders in space sustainability: the SSR Rating Institute at eSpace-EPFL for assessment and a third-party institute for transparent fund allocation.

Our financial modeling indicates that the DOF can generate sustainable funding from its inception, with minimal initial costs to operators. The fund is projected to stabilize by the eighth year of operation, supporting continued market growth while significantly reducing debris-related risks. Building on this structured approach, the DOF framework transforms debris mitigation from a competitive disadvantage to a culture of shared responsibility among spacefaring entities, while establishing a self-sustaining model that bridges current technological capabilities with practical implementation needs. This research contributes to the growing body of work on space sustainability and presents a viable path to ensure the long-term accessibility of Earth's orbital environment.